HOST

CLIENT APPLICATION

COMMAND
APDU

RESPONSE
APDU

READER DRIVER

HOST/READER
PROTOCOL

APDU'S

READER

APDU'S

PROCESSES APDU'S

CARD APPLICATION

T=0/T=1
PROTOCOL

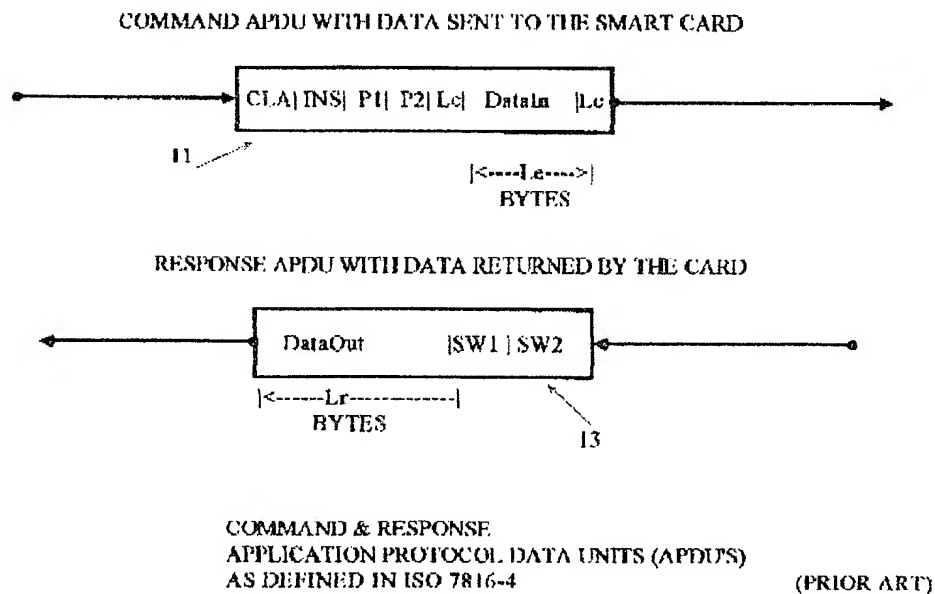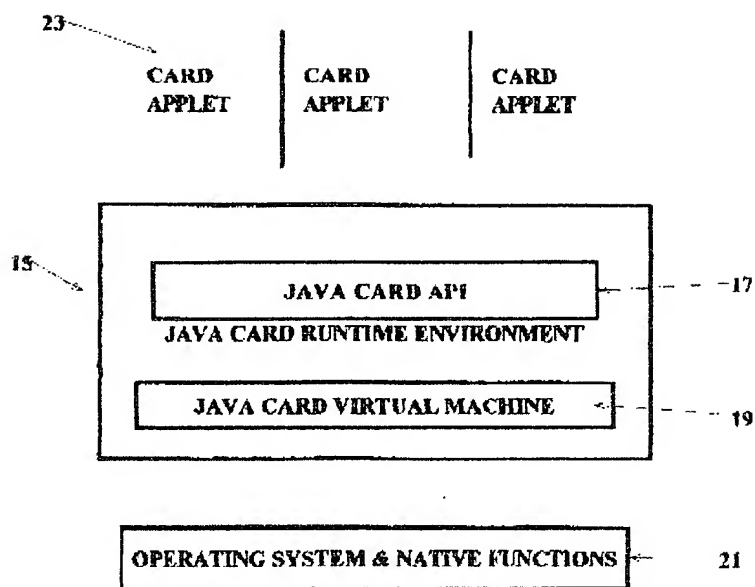SMART CARD/TERMINAL CLIENT SERVER COMMUNICATIONS   (PRIOR ART)

FIGURE 1A

COMMAND APDU WITH DATA SENT TO THE SMART CARD

CLA| INS| P1| P2| Lc| DataIn |Le

|<----Le---->|
BYTES

RESPONSE APDU WITH DATA RETURNED BY THE CARD

DataOut |SW1 | SW2

|<------Lr------------|
BYTES

COMMAND & RESPONSE
APPLICATION PROTOCOL DATA UNITS (APDU'S)
AS DEFINED IN ISO 7816-4   (PRIOR ART)

FIGURE 1B

VANDEWALLE ET AL

CARD APPLET	CARD APPLET	CARD APPLET

23

15

JAVA CARD API — — -17

JAVA CARD RUNTIME ENVIRONMENT

JAVA CARD VIRTUAL MACHINE — — - 19

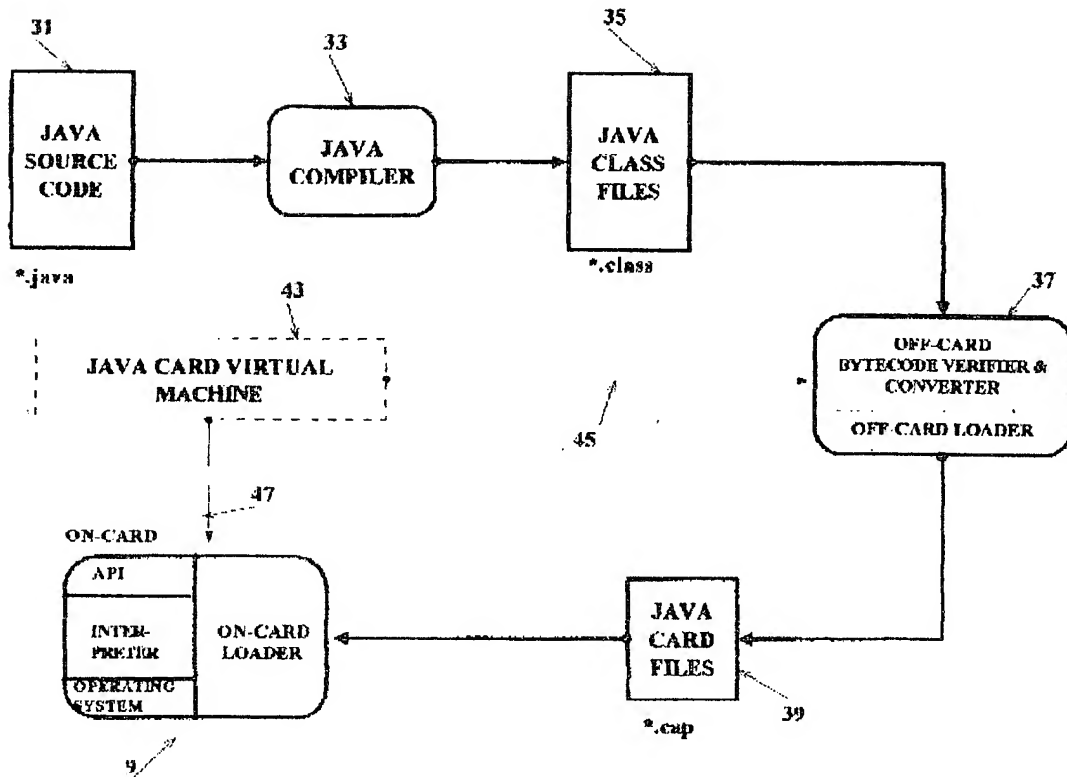OPERATING SYSTEM & NATIVE FUNCTIONS 21

javacard.framework——————>ISO 7816-3/4 CLASSES FOR HANDLING
                                COMMAND & RESPONSE APDU'S

javacardx.framework—————>ISO 7816-4 COMPATIBLE FILE SYSTEM

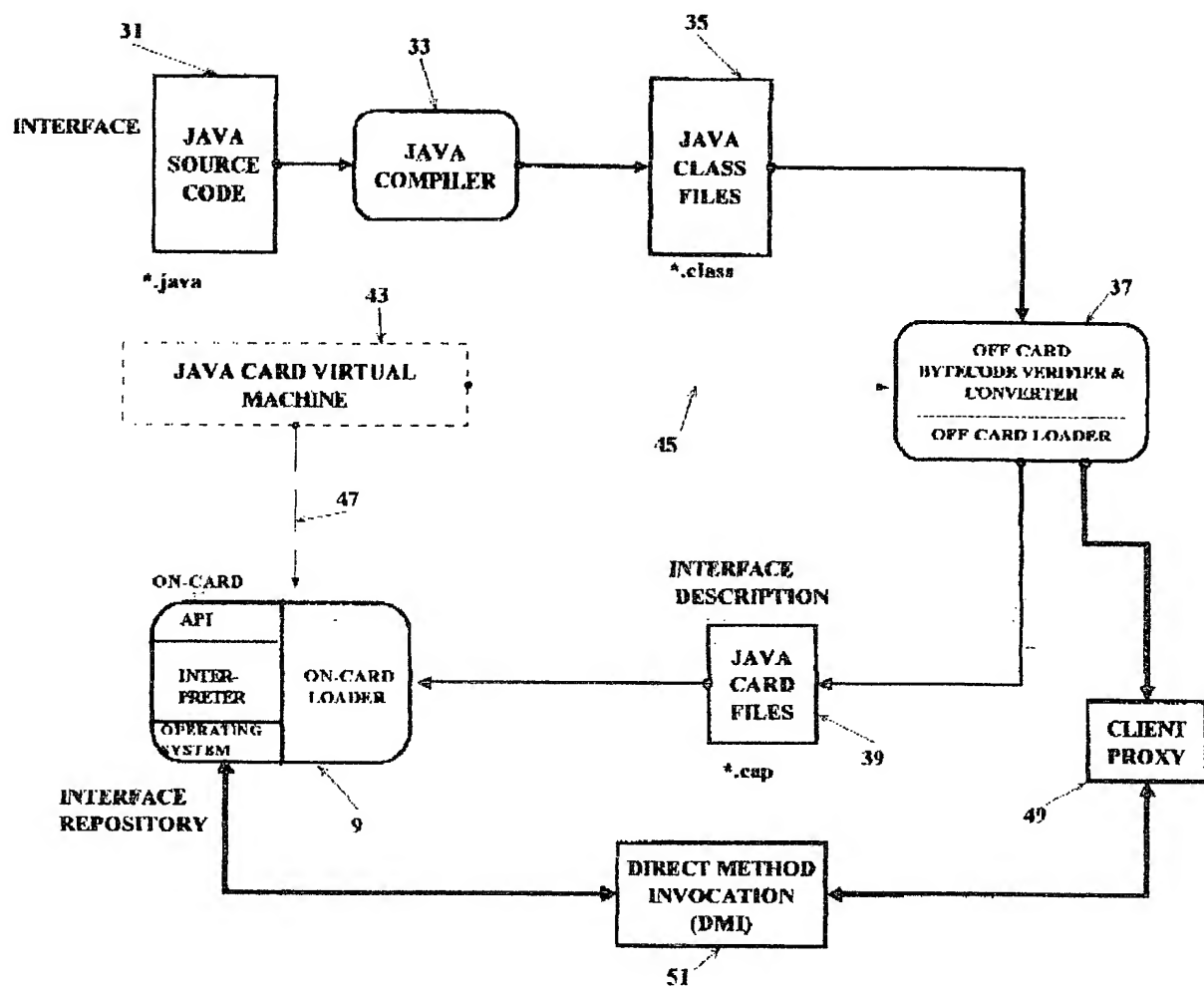SYNOPTIC VIEW OF JAVA CARD ARCHITECTURE (PRIOR ART)

FIGURE 2

VANDEWALLE ET AL

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JAVA
SOURCE
CODE

*.java

33

JAVA
COMPILER

35

JAVA
CLASS
FILES

*.class

37

OFF-CARD
BYTECODE VERIFIER &
CONVERTER

OFF-CARD LOADER

43

JAVA CARD VIRTUAL
MACHINE

45

47

ON-CARD

| API |
| INTER-PRETER |
| OPERATING SYSTEM |

ON-CARD
LOADER

9

39

JAVA
CARD
FILES

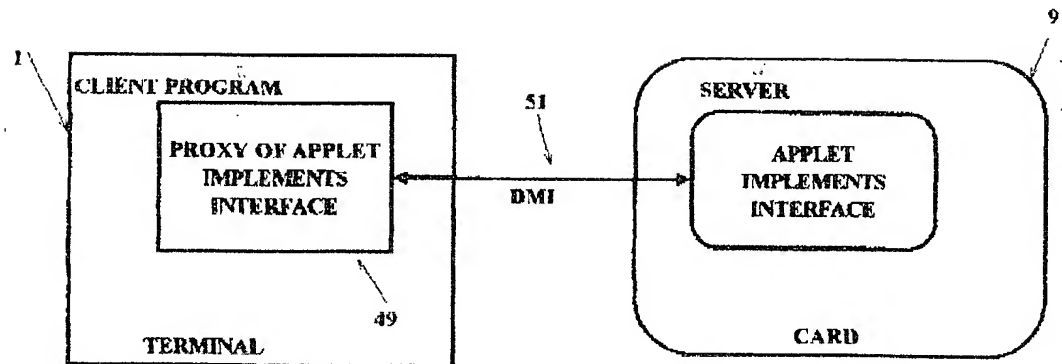*.cap

STRUCTURING OF A JAVA CARD VIRTUAL MACHINE   (PRIOR ART)

FIGURE 3A

VANDEWALLE ET AL

JAVA CARD VIRTUAL MACHINE
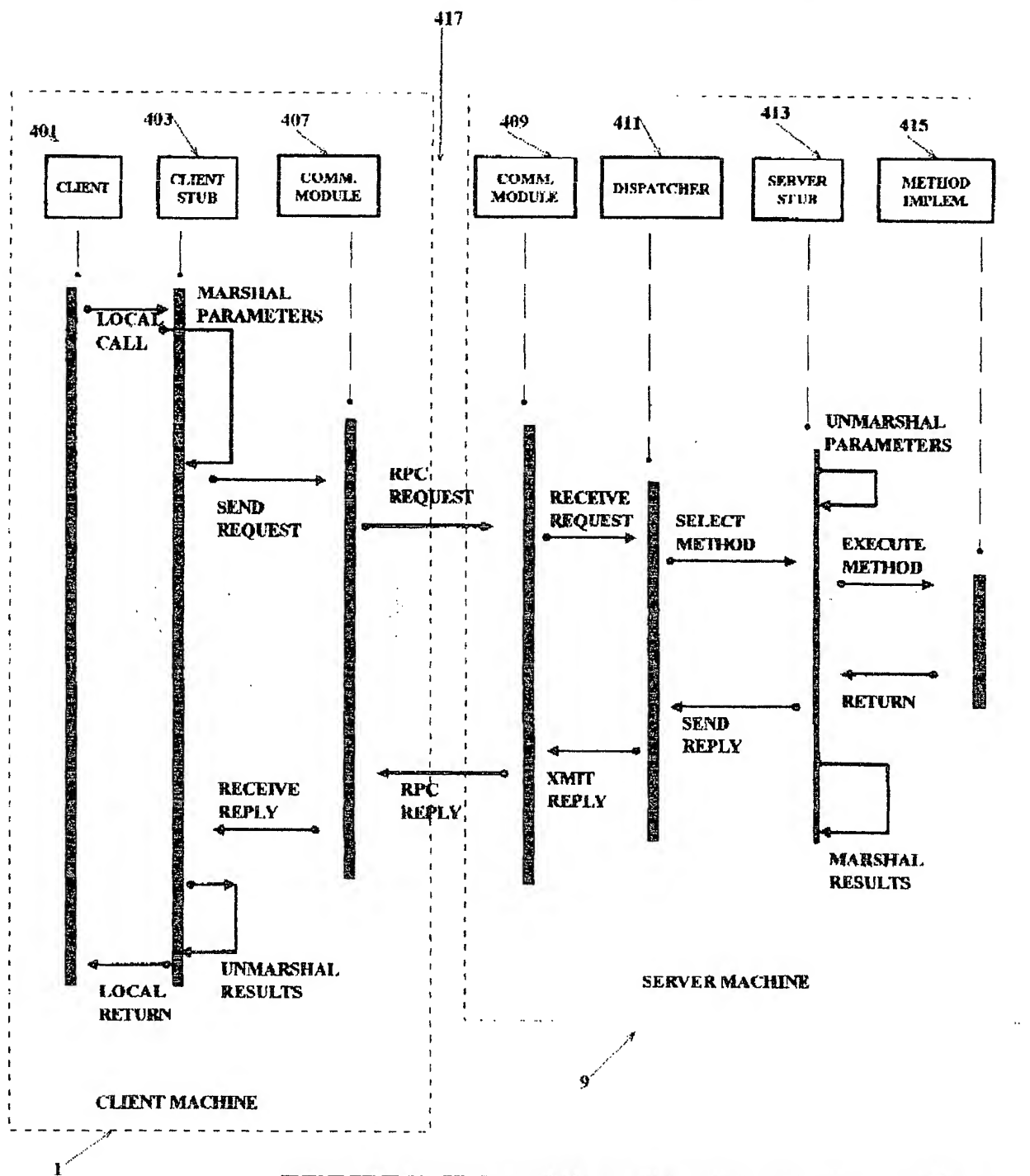WITH INTERFACE, PROXY, AND
DMI CONSTRUCTS

FIGURE 3B

SYNOPTIC VIEW OF APPLET & PROXY IN CLIENT SERVER RELATIONSHIP

FIGURE 3C

VANDE\ .LE ET AL
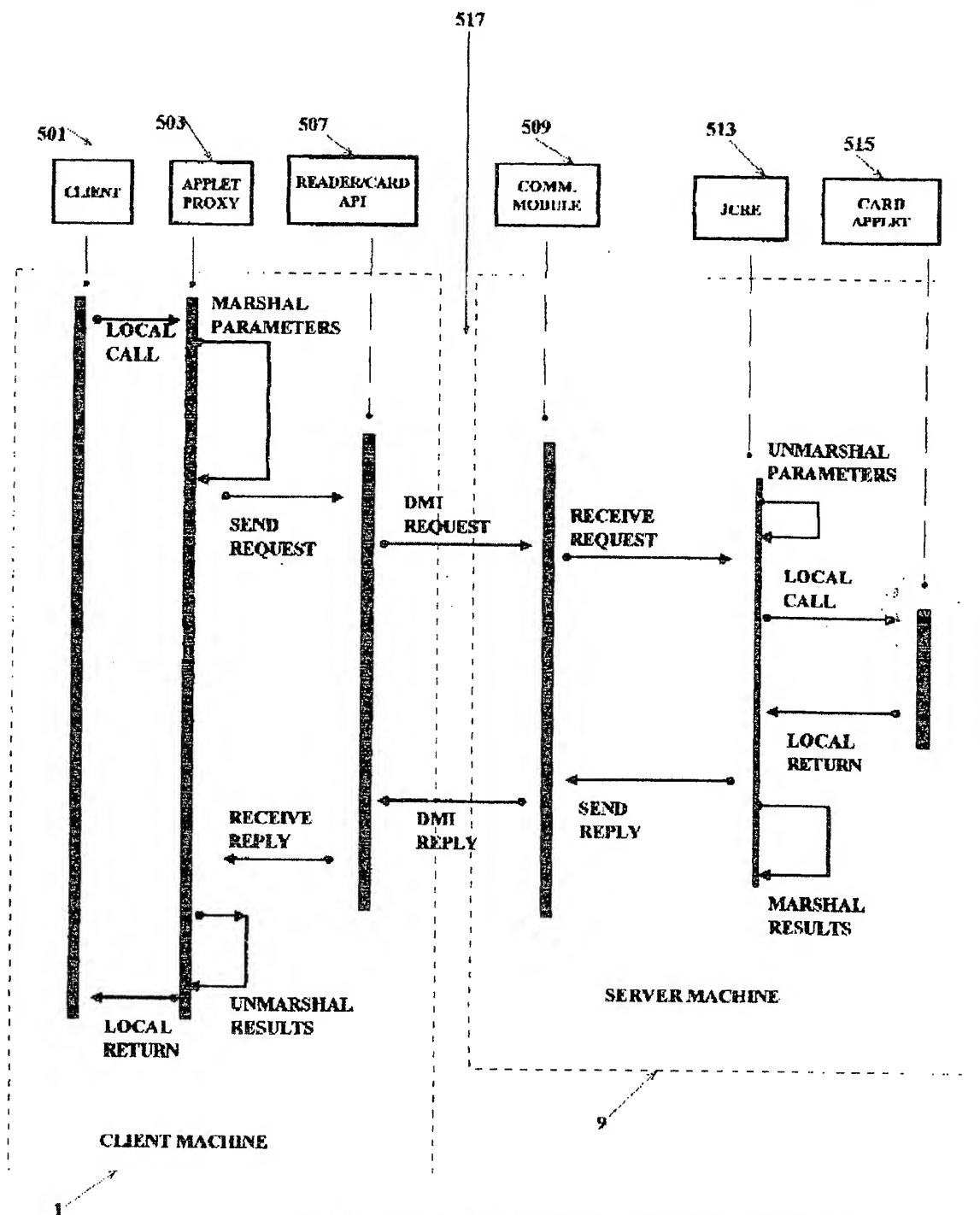
417

401	403	407	409	411	413	415
CLIENT	CLIENT STUB	COMM. MODULE	COMM. MODULE	DISPATCHER	SERVER STUB	METHOD IMPLEM.

MARSHAL
LOCAL   PARAMETERS
CALL

SEND   RPC   RECEIVE
REQUEST   REQUEST   REQUEST

UNMARSHAL
PARAMETERS

SELECT
METHOD

EXECUTE
METHOD

RETURN

SEND
REPLY

RECEIVE   RPC   XMIT
REPLY   REPLY   REPLY

MARSHAL
RESULTS

UNMARSHAL
LOCAL   RESULTS
RETURN

SERVER MACHINE

9

CLIENT MACHINE

1

EVENT TIME DIAGRAM FOR REMOTE PROCEDURE CALL (RPC)   (PRIOR ART)

FIGURE 4

VANDEWALLE ET AL

517

501   503   507   509   513   515

| CLIENT | APPLET PROXY | READER/CARD API | COMM. MODULE | JCRE | CARD APPLET |

MARSHAL
PARAMETERS

LOCAL
CALL

SEND
REQUEST

DMI
REQUEST

RECEIVE
REQUEST

UNMARSHAL
PARAMETERS

LOCAL
CALL

LOCAL
RETURN

RECEIVE
REPLY

DMI
REPLY

SEND
REPLY

MARSHAL
RESULTS

SERVER MACHINE

UNMARSHAL
RESULTS

LOCAL
RETURN

9

CLIENT MACHINE

1

EVENT TIME DIAGRAM FOR DIRECT METHOD INVOCATION

FIGURE 5